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(54) Title: COMPOSITE MATERIAL FOR THE INSULATION OF CONTAINERS AND CONTAINERS FORMED THEREFROM (57) Abstract <p>A composite material with qualities of insulation suitable for creating an insulative lining within cartons containing perishable products or encapsulating packages in which specified thermal stability is necessary is formed into one or more panels comprising a thermal property material core on at least one side of which is disposed a stiffening material such as card, both materials being encased within a plastics film such as polyester which may be metallized and the whole sealed to provide a waterproof insulative panel.</p>		

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COMPOSITE MATERIAL FOR THE INSULATION OF CONTAINERS
AND CONTAINERS FORMED THEREFROM

The invention relates to a composite material for use in the insulation of containers and to insulated containers which incorporate such composite material. The composite material has insulating properties for the storage of hot or cold items and the invention is particularly useful in forming packaging containers for the transport of products which are perishable or which are required to remain frozen, chilled or heated whilst in transit.

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Preferably, composite material according to the invention should be resilient to impact and rough handling during the packing and freighting, yet not be overlarge in size when placed in or around a packaging container; not excessively heavy in weight nor unduly expensive to manufacture. In addition, such composite material should have storage characteristics which permit its stockpiling without occupying excessive space and be capable of placement into, upon or over a container and upon termination of use be capable of disposal without causing pollution or with an inability to be absorbed into recycling processes or reclamation.

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For containers which are required to transport perishable items like fish or certain agricultural products which may require the inclusion of refrigerants, it is desirable that the composite material which will form the insulation of such containers be formed from material of which at least part is waterproof.

The present invention seeks to satisfy all these requirements in whole or in part whilst having none of the adverse properties of many materials currently used in the formation of such packaging, such as expanded polystyrene, which is a material virtually impossible to recycle or destroy without creating potentially harmful side effects.

According to the present invention, a composite material is formed into one or more panels for use as an insulator, said composite material comprising a core of thermal-property material, a sheet of stiffening material adjacent at least one side of said core and an outer flexible plastics film material disposed such that said thermal and stiffening materials are enclosed within the flexible plastics film.

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Embodiments of the invention will now be described by way of example.

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The differing materials which comprise the composite material have individual properties which contribute to the desired final characteristics of the insulation. The core of the material may be a slab of man-made
5 mineral fibre such as rock wool - this material is extensively used in varying applications for its thermal properties, which are well proven. Usually the rock wool will incorporate a binder such as cured urea extended phenol formaldehyde resin, or starch and
10 mineral oil.

To this core, which can be of any manageable size and any desired thickness suitable for the required degree of insulation, a stiffening material such as card, is
15 applied and preferably laminated to at least one of two main surfaces of the core. The stiffening material may be solid or corrugated to any manageable size and thickness not necessarily to the same dimensions as the core. The stiffening material may be metallized,
20 printed, foil-stamped, embossed or lacquered and for any of these operations card is a suitable medium. If card is used and is manufactured in corrugated format, then additional thermal enhancement may be obtained. Furthermore, such corrugation will provide additional
25 stiffening in those instances where the composite material is used as a container per se without the addition of external packaging, or where the composite

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material is used as an outer cladding to create a thermal barrier around a package.

In those instances where the composite material is external to the product to be insulated and any additional inner wrapping, the stiffening material may be used to display graphics and information in such manner as to be visible when the outer covering of plastic film is transparent or translucent and if coated with a reflective surface, to contribute as a thermal barrier to solar rays or other sources of heat.

To contain the core and stiffening material as a single unit and to provide additional protection against impact whilst also contributing, in certain specific aspects i.e. when metallized, to insulation, plastics film of a size which exceeds both core and stiffening material is positioned in such manner that the core and stiffening material are contained and enclosed within the plastic film.

Such containment may be achieved by using the film in single sheet format so that it is folded around the core and stiffening material whereafter three edges of the film are then sealed and the sheet then encloses the other materials so that the whole forms a panel which may be used as an insulating barrier within any form of

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packaging. By placing more than one such combination of core and stiffening material within a plastics film material and then sealing between the combination of core and stiffening material as well as around the three
5 outer edges a series of panels connected one to the next may be obtained. If at least one of the outer edges of the film initially is left unsealed, the plastics film may first be prepared to receive the core and stiffening materials. The plastics film sheet can of course be
10 folded upon itself to create, together with the core, an insulated pocket to which a refrigerant may be added without making contact with the materials other than the plastics film.

15 According to one method of manufacture of the composite material it is possible to obtain similar enclosure of the core and stiffening material by using two or more separate sheets of plastics film which may not necessarily be of the same composition but which should
20 be inert to the content of the package, non-toxic and compatible to the joining of one sheet to the other. If a pocket is required it may included in one or both sheets of the plastics film and positioned on whichever side of the core and stiffening material is best suited
25 to the purpose of enclosure, i.e. if to

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contain instructions on the stiffening material side, if
to contain refrigerant on the core side.

If two different types of plastics film are used,
5 additional protection and thermal resistance may be
obtained, such as combining a metallized film and an
encapsulated air bubble film. Combination films can add
strength and impact resistance and, in certain
instances, a combination of non-permeable and permeable
10 films may provide a waterproof barrier on one side of a
composite material panel whilst allowing moisture to
pass through the other side which may be advantageous
where the composite material is used as a container for
plants or other horticultural or agricultural
15 applications which require retention of heat allied to
moisture encapsulation. In addition the plastics film
enclosing the core and stiffening material may have a
perforate line at preselected locations along its length
so that if manufactured in multiple panel format, one or
20 more panels of the composite material may be detached or
if manufactured without the addition of the core and
stiffening material, may be detached and then the other
materials added thereafter.

25 As examples of the versatility of the composite
material, three specific applications are given below,

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but whilst these relate to use of the composite material within the packaging art it must be recognised that various other applications related e.g. to home insulation, particularly roof/loft cladding, seed and plant packaging and growing, thermal bags and other packs which may incorporate regrigerants, insulated clothing and accessories, thermal carpet underlay, table and furniture surface insulation and protection and numerous other uses are within the scope of the invention as defined bythe appended claims.

Example 1

A triple panel section comprising three composite material panels with sealed spaces between each panel and further including a separate composite material panel are made from the composite material in a manner previously described. The single panel is placed at the bottom of an open-topped container which is then filled with perishable product and refrigerant and the triple panel is placed over the content with the centre panel across the top of the open container top and one panel descending upon each of the respective sides of the container. A separate lid which includes side and end walls is then placed over the whole, thus creating an

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enclosed package which is insulated over the inner top, bottom and side walls thereof.

Example 2

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A four sided panel section comprising four main composite material panels with sealed spaces between each panel foldable into a sleeve and additional 'end' panels comprising sections attached to one or more of the main panels is made from the composite material and the whole assembled to form an outer enclosure into which enclosure is inserted a package comprising product. The end panels of the enclosure covering are folded and sealed to the main panels so as to encapsulate and create a thermal barrier around the internal package. The enclosure may be inserted into a two-part outermost box comprising base and lid.

Example 3

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A double panel section comprising two composite material panels with sealed spaces between each panel both of which panels include a pocket. The pockets accommodate refrigerants and, in use, one panel is laid upon the base of a container so that the sealed space between the panels is disposed adjacent to one side wall of the container. Product is inserted into the container

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and received on top of the said one panel whereafter the other panel is laid over the product thus forming a thermal wrap inclusive of refrigerant around the content of the container.

5

If the composite material is attached to pre-formed and cut packaging material from which e.g. and outer box like container can be formed, it is possible for the composite material and packaging material to be stored
10 as one entity and when required, to be assembled in one operation.

According to the size and thickness of the core material, the composite material may be used in widely
15 varying sizes of packaging, from confectionery boxes to outsize cartons, as well as thermal wrap within airfreight and other containers, thereby reducing the requirement of specialised cartons used for the containment of perishable products transported within
20 such containers.

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CLAIMS

1. A composite material for forming one or more insulated panels, said composite material comprising a core of thermal-property material on at least one side of which is disposed a sheet of stiffening material and
5 wherein a plastics film material covers said thermal and stiffening materials in such manner that thermal and stiffening materials are enclosed within the flexible plastics film.
- 10 2. A composite material as claimed in Claim 1 wherein the said thermal-property material is inert vitreous silicate wool.
3. A composite material as claimed in Claim 1 wherein
15 the said thermal property material is inert rockwool.
4. A composite material as claimed in Claim 1 wherein the said thermal-property material is cellulose fibres.
- 20 5. A composite material as claimed in Claim 1 wherein the said thermal-property material is borosilicate glass.

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6. A composite material as claimed in Claim 1 wherein the said thermal-property material is cotton linter.

7. A composite material as claimed in Claim 1 wherein
5 the said thermal-property material is rigid.

8. A composite material as claimed in Claim 1 wherein the said thermal-property material is flexible.

10 9. A composite material as claimed in any of the preceding claims wherein the said stiffening material is fibreboard.

10. A composite material as claimed in any of claims 1
15 to 8 wherein the said stiffening material is corrugated board.

11. A composite material as claimed in any of claims 1 to 8 wherein the said stiffening material is card.

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12. A composite material as claimed in any of claims 1 to 8 wherein the said stiffening material is a plastics material.

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13. A composite material as claimed in any of the preceding claims wherein the said stiffening material is rigid.

5 14. A composite material as claimed in any of claims 1 to 12 wherein the said stiffening material is flexible.

15. A composite material as claimed in any of the preceding claims wherein said stiffening material is
10 metallized.

16. A composite material as claimed in any of the preceding claims wherein said stiffening material is printed.

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17. A composite material as claimed in any of the preceding claims wherein said stiffening material is foiled.

20 18. A composite material as claimed in any of the preceding claims wherein said stiffening material is embossed.

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19. A composite material as claimed in any of the preceding claims wherein said stiffening material is lacquered.

5 20. A composite material as claimed in any of the preceding claims wherein the said plastics film is polyester.

21. A composite material as claimed in any of claims 1
10 to 19 wherein the said plastics film is polypropylene.

22. A composite material as claimed in any of the preceding claims wherein the said plastics film comprises encapsulated air bubbles.

15

23. A composite material as claimed in any of the preceding claims wherein the said plastics film is a laminate of two or more plastics.

20 24. A composite material as claimed in any of the preceding claims wherein the said plastics film is transparent.

25 25. A composite material as claimed in any of claims 1 to 23 wherein the said plastics film is translucent.

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26. A composite material as claimed in any of claims 1 to 23 wherein the said plastics film is opaque.

27. A composite material as claimed in any of the preceding claims wherein the said plastic film is metallized.

28. A composite material as claimed in any of the preceding claims wherein the said plastics film is printed.

29. A composite material as claimed in any of the preceding claims wherein the said plastics film is foiled.

30. A composite material as claimed in any of the preceding claims wherein the said plastics film is embossed.

31. A composite material as claimed in any of the preceding claims wherein the said plastic film is lacquered.

32. A composite material as claimed in any of the preceding claims wherein the said plastics film has at least two edges joined together by heat-sealing.

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33. A composite material as claimed in any of claims 1 to 32 wherein the said plastics film has at least two edges joined together by adhesive.

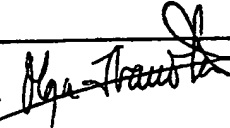
5 34. An insulated container substantially formed from or comprising a composite material according to any of the preceding claims.

35. A multiple panel composite material substantially
10 as hereinbefore described with reference to Example I, Example II or Example III.

INTERNATIONAL SEARCH REPORT

PCT/GB 90/01455

International Application No

I. CLASSIFICATION OF SUBJECT MATTER (if several classification symbols apply, indicate all) ⁶		
According to International Patent Classification (IPC) or to both National Classification and IPC: Int.Cl. 5 B32B27/06 ; B65D81/38 ; F16L59/02		
II. FIELDS SEARCHED		
Minimum Documentation Searched ⁷		
Classification System	Classification Symbols	
Int.Cl. 5	B32B ; B65D ; F16L	
Documentation Searched other than Minimum Documentation to the Extent that such Documents are Included in the Fields Searched ⁸		
III. DOCUMENTS CONSIDERED TO BE RELEVANT⁹		
Category ¹⁰	Citation of Document, ¹¹ with indication, where appropriate, of the relevant passages ¹²	Relevant to Claim No. ¹³
X	FR,A,2234132 (MONSANTO LTED.) 17 January 1975 see page 1, lines 22 - 35 see page 2, line 25 - page 3, line 34 see page 4, line 35 - page 6, line 6 ---	1, 2, 8, 12, 21, 32-35
X	US,A,4642970 (BANE) 17 February 1987 see column 2, lines 6 - 19 see column 2, lines 61 - 67 see column 3, lines 11 - 18 see column 4, lines 10 - 57 see column 5, lines 4 - 19 see column 6, lines 9 - 23; figures 1, 2, 4 --- -/-	1, 12, 15, 24, 32, 34
<p>¹⁰ Special categories of cited documents: ¹⁰</p> <p>"A" document defining the general state of the art which is not considered to be of particular relevance</p> <p>"E" earlier document but published on or after the international filing date</p> <p>"I" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)</p> <p>"O" document referring to an oral disclosure, use, exhibition or other means</p> <p>"P" document published prior to the international filing date but later than the priority date claimed</p> <p>"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention</p> <p>"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step</p> <p>"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.</p> <p>"A" document member of the same patent family</p>		
IV. CERTIFICATION		
Date of the Actual Completion of the International Search	Date of Mailing of this International Search Report	
17 JANUARY 1991	11. 02. 91	
International Searching Authority	Signature of Authorized Officer	
EUROPEAN PATENT OFFICE	IBARROLA TORRES O. 	

III. DOCUMENTS CONSIDERED TO BE RELEVANT (CONTINUED FROM THE SECOND SHEET)		
Category *	Citation of Document, with indication, where appropriate, of the relevant passages	Relevant to Claim No.
A	<p>US,A,4662521 (MORETTI) 05 May 1987 see claim 1</p> <p>see column 2, lines 42 - 63; figures 1, 2</p>	1, 2, 8, 14, 15, 20, 23, 32, 34
A	<p>US,A,3583459 (M. NAPPE) 08 June 1971 see column 1, lines 6 - 8 see column 2, line 71 - column 3, line 32; figures 1, 2, 5</p>	1, 2, 32, 34
A	<p>US,A,4460645 (JONES ET AL.) 17 July 1984 see column 4, lines 22 - 30 see column 4, lines 47 - 53; figures 1, 2, 3 see claims 6, 11, 12</p>	1

**ANNEX TO THE INTERNATIONAL SEARCH REPORT
ON INTERNATIONAL PATENT APPLICATION NO.**

GB 9001455
SA 40375

This annex lists the patent family members relating to the patent documents cited in the above-mentioned international search report.
The members are as contained in the European Patent Office EDP file on
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US-A-4642970	17-02-87	None	
US-A-4662521	05-05-87	EP-A,B 0196721	08-10-86
US-A-3583459	08-06-71	None	
US-A-4460645	17-07-84	None	